

Some Cychrine Species (Coleoptera, Carabidae) from Central Sichuan, China: Descriptions of Two New Species and Evolutionary Considerations

Yûki IMURA

Department of Gynecology, Tôkyû General Hospital, Kita-senzoku,
1–45–6, Ôta-ku, Tokyo, 145–0062 Japan,

Zhi-Hui SU and Syozo OSAWA

JT Biohistory Research Hall, 1–1 Murasaki-Cho,
Takatsuki, Osaka, 569–1125 Japan

Abstract Two new species, *Cychrus zhoui* nov. and *Cychrus okamotoi* nov., are described from central Sichuan, China. A phylogenetic tree is constructed for the new species together with *Cychrus thibetanus* and *Cychropsis draconis*, both from Sichuan, and *Cychrus morawitzi* from Hokkaido, Japan, based on the mitochondrial ND5 gene sequences.

In the Sino-Japanese Cooperative Expedition to the Fengtongzhai Nature Protective Area of central Sichuan, China, made in June of 1997, we collected four cychrine species, of which two *Cychrus* species have been recognized as new to science and are described in this paper. Two other species have been identified with *Cychrus thibetanus* and *Cychropsis draconis*, respectively. A phylogenetic tree has been constructed from the mitochondrial ND5 gene sequences of these four species together with *Cychrus morawitzi* from Hokkaido, Japan, and several representative species belonging to the tribe Carabini.

Materials and Methods

For the analytical methods of the mitochondrial ND5 gene sequences, and construction of the NJ phylogenetic tree, see SU *et al.* (1996 a, b) and IMURA *et al.* (1997).

Results and Discussion

List of Cychrine Species Treated in this Study

1) *Cychrus zhoui* IMURA, SU et OSAWA, sp. nov.

(Figs. 1–2, 5–6)

Description. Length: 13.2 mm (including mandibles). Allied to *Cychrus wuyipeng* DEUVE known so far only from Wolong situated in the adjacent valley of Fengtongzhai, but morphologically distinguishable from it by the following points: 1) mandibles a little shorter and more strongly arcuate inwards; 2) labrum a little shorter and robuster; 3) lateral margins of pronotum hardly reflexed above in the posterior portions, with three (on left side) or two (on right side) marginal setae (only a single seta on both sides in *C. wuyipeng*); 4) elytra a little slenderer, their shoulders more effaced, with the discs more strongly convex above and more remarkably uneven in the sculptural condition; 5) male genitalia more strongly curved ventrad in lateral view, with the aedeagal apex more sharply pointed in dorsal view.

Holotype: ♂, above Guobaye (so-called "Mt. Baiyu Shan"), 2,700–2,800 m in altitude, on the Qionglai Shan Mts. stretching along the left side of the Riv. Dong He, in the Fengtongzhai Nature Protective Area of Baoxing Xian, central Sichuan, China, 4–VI–1997, Y. IMURA, Z.-H. SU & M. OKAMOTO leg., to be preserved in the collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing.

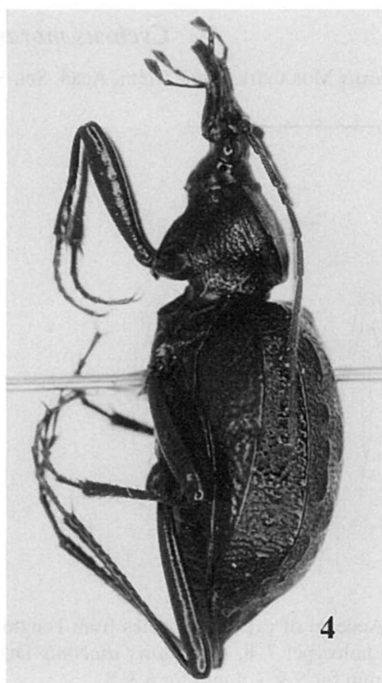
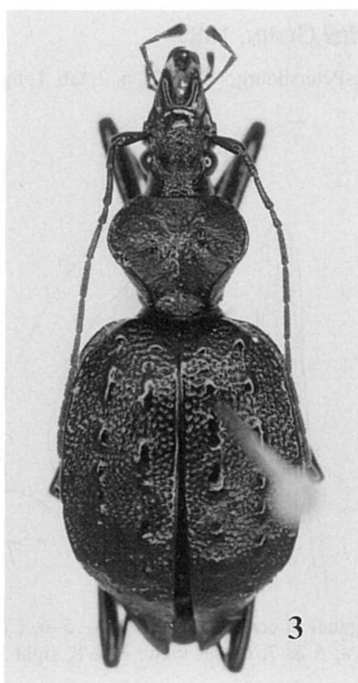
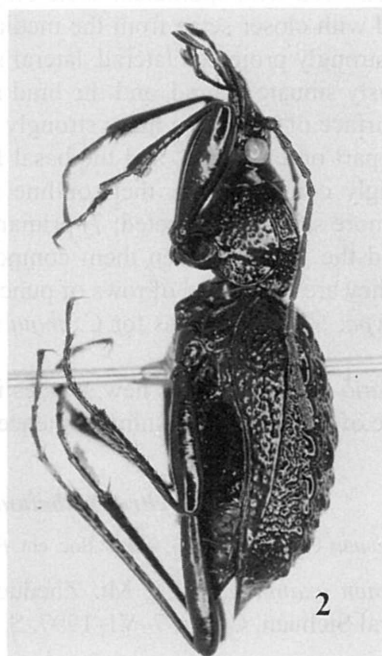
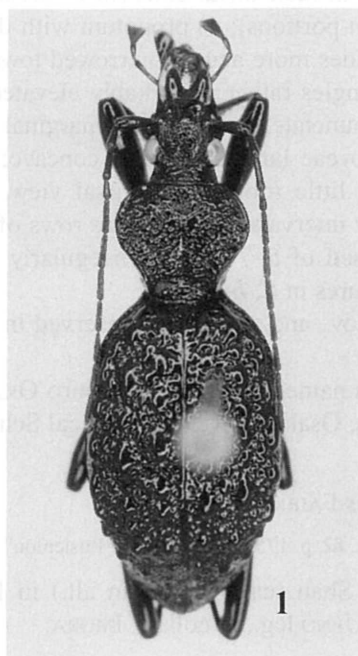
Derivatio nominis. This new species is named after Dr. Hong-Zhang ZHOU, Associate Professor and Deputy Director of the Institute of Zoology, Chinese Academy of Sciences, Beijing.

Notes. *Cychrus zhoui* nov. was collected by bait traps set among rather rich undergrowths covering the floor of the old *Abies* forest developed on the western slope of so-called "Mt. Baiyu Shan" above Guobaye. The following species are sympatric with the new species: *Carabus (Neoplesius) sichuanicola*, *Cychrus okamotoi* nov. and *Cychropsis draconis*.

2) *Cychrus okamotoi* IMURA, SU et OSAWA, sp. nov.

(Figs. 3–4)

Description. 15.4 mm (including mandibles). Most closely allied to *Cychrus brezinai* DEUVE described from the eastern slope of Mt. Gongga Shan, but readily discriminated from it by the following points: 1) dorsal surface of head more strongly rugoso-punctate, with a pair of deep gutters on each side at about the mid-eye level on the posterior part of vertex; 2) antennae with the relative length of the fourth segment for the third about 0.55 (0.61 in *C. brezinai*); 3) both the third and fourth segments of



antennae scattered with sporadic setae only at their distal ends (in *C. brezinai*, they are covered with closer setae from the median portions); 4) pronotum with the widest part more strongly projected laterad, lateral sides more acutely narrowed towards base and obviously sinuate behind, and the hind angles rather remarkably elevated dorsad; 5) discal surface of pronotum more strongly punctate, with a single marginal seta near the widest part on each side, and the basal foveae far more deeply concave; 6) elytra more strongly convex above, their outline a little robuster in dorsal view, with the shoulders more strongly projected; 7) primary intervals recognised as rows of large tubercles, and the areas between them composed of 5–7 rows of irregularly set small granules (they are composed of rows of punctures in *C. brezinai*).

Holotype: ♀, same data as for *C. zhoui* nov., and also to be preserved in the same Institute.

Derivatio nominis. This new species is named after Dr. Munehiro OKAMOTO of the Institute of Experimental Animal Sciences, Osaka University Medical School.

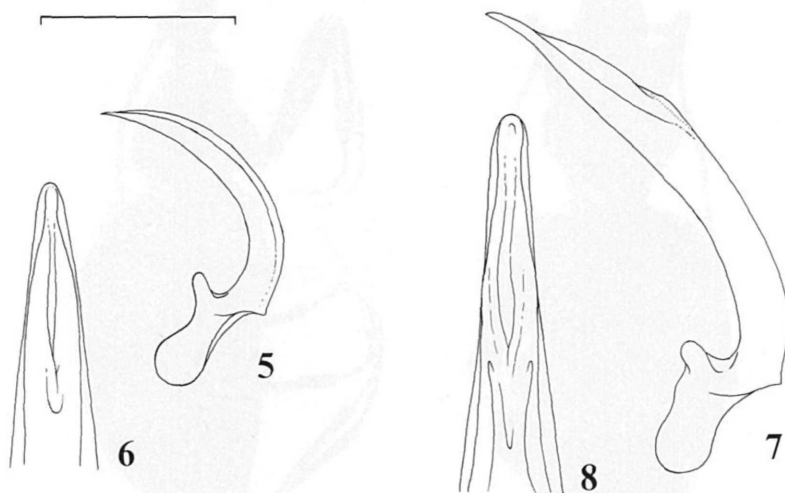
3) *Cychnus tibetanus* FAIRMAIRE, 1893

Cychnus tibetanus FAIRMAIRE, 1893, Anns. Soc. ent. Fr., **62**, p. 175; type locality: "Tatsienlou".

Specimen examined. 1 ♂, Mt. Zheduo Shan (ca. 4,000 m in alt.) in Kangding Xian, central Sichuan, China, 7–VI–1997, S. UENO leg., in coll. Y. IMURA.

4) *Cychnus morawitzi* GÉHIN, 1885

Cychnus convexus MORAWITZ, 1863, Mém. Acad. Sci. St.-Petersbourg, (7), **6** (3), p. 7, tab. 1, fig. 2; type lo-



Figs. 5–8. Aedeagi of cychnine species from Fengtongzhai in central Sichuan. — 5–6, *Cychnus zhoui* sp. nov., holotype; 7–8, *Cychnopsis draconis* DEUVE; 5 & 7, dorsal view; 6 & 8, right lateral view. Scale: 2 mm for 5 & 7, 1 mm for 6 & 8.

cality: Hakodate, in coll. Zoological Institute, Academy of Sciences, St. Petersburg [nec HEER, 1837].
Cychrus morawitzi GÉHIN, 1885, Catalogue synonymique et systématique des Coléoptères de la tribu des Carabides, Prague, p. 75.

Specimen examined. 1 ♂, near Lake Daisetsu-ko on the southeastern slope of the Daisetsu-zan Mts., in Kamikawa-gun, Hokkaido, Japan, N. YASUDA leg.

5) *Cychropsis draconis* DEUVE, 1990

Cychropsis draconis DEUVE, 1990, L'Entomologiste, **46**, p. 118; type locality: Chine, Sichuan, Songpan Xian, 3,400 m, in coll. Muséum National d'Histoire Naturelle, Paris.

Specimen examined. 1 ♂, same data as those of *Cychrus zhoui* nov. and *Cy. okamotoi* nov., though the collecting site was a little higher in altitude (ca. 2,900 m), in coll. Y. IMURA.

Notes. This species was described by DEUVE from Songpan Xian of N. Sichuan, and was subsequently recorded by the same author from Wolong of the central part of the same province. Our specimen from Fengtongzhai seems to be identical with DEUVE's species, though bearing a little more gently rounded aedeagal apex in dorsal view.

Evolutionary Considerations

The topology on the phylogenetic tree of the Cychrini, the Calosomina and the Carabina is unchanged from that reported by SU *et al.* (1996 a) by addition of the sequences analysed in this study.

Four cychrine species treated in this study and *Cychrus morawitzi* from Japan constitute a clear monophyletic cluster. *Cychropsis draconis* shares the common ancestry with all other *Cychrus* species. The following three facts should be noted:— 1) The origin of the Cychrini is old and the Cychrini forms an outgroup of the Carabini; 2) Diversification of the cychrine species examined started somewhat before an explosive radiation of the major carabine groups (3–40 Myr ago; see SU *et al.*, 1996 a, b); 3) The branching points of all the species are very deep. Despite such long histories of the cychrine evolution, the fundamental morphology has not changed, in contrast to a remarkable morphological diversification in the Carabina. *Cychrus zhoui* nov. and *Cy. okamotoi* nov. were collected at the same site, and yet the separation of these two species took place long time ago. This suggests that these sympatrically occurring two species have been reproductively isolated for a long time with only a small morphological diversification.

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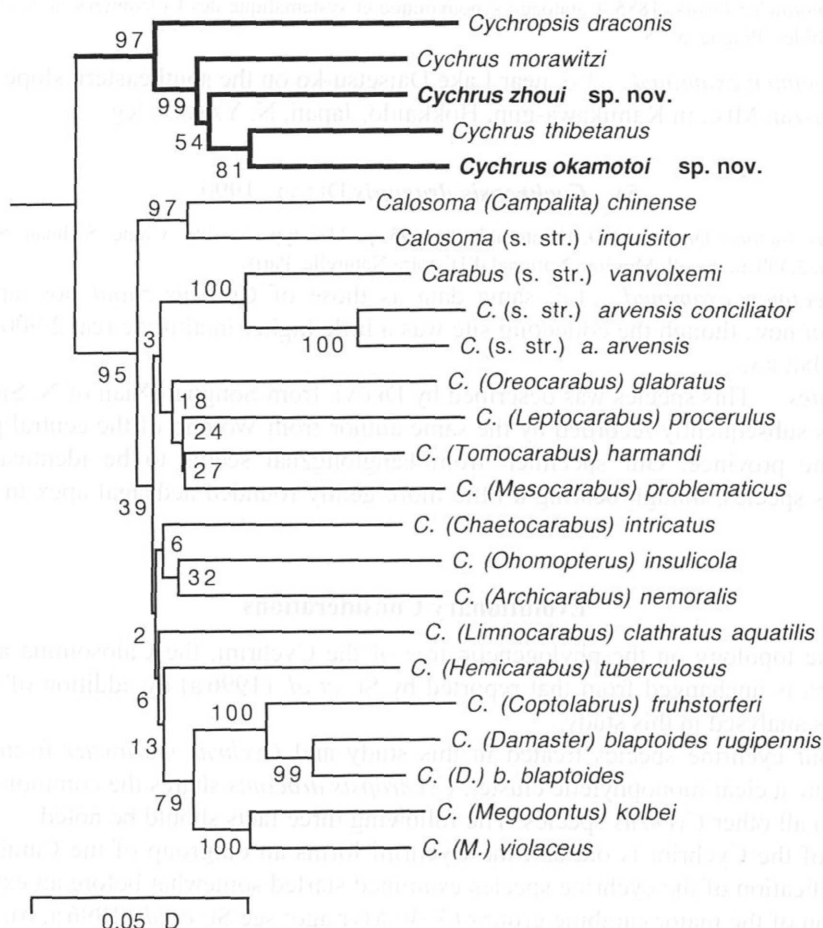


Fig. 9. Phylogenetic tree of the Carabinae based on 1,069-bp sequences of ND5 gene using the NJ method (SAITOU & NEI, 1987). D indicates KIMURA's two-parameter evolutionary distance (KIMURA, 1980). The values at the nodes represent percent of bootstrap confidence level (based on 1,000 resamplings) (FELSENSTEIN, 1985). The phylogenetic tree was outgroup-rooted using the ND5 mitochondrial gene of *Drosophila melanogaster* (GARESSE, 1988) and *D. yakuba* (CLARY & WOLSTENHOLME, 1985). Accession numbers for GenBank data base are as follows: *Cychropsis draconis* (AB010125), *Cychrus morawitzi* (D50347), *Cy. zhoui* nov. (AB010127), *Cy. thibetanus* (AB010126), *Cy. okamotoi* nov. (AB010128), *Calosoma (Campalita) chinense* (D50343), *C. (s. str.) inquisitor* (D50342), *Carabus (s. str.) vanvolxemi* (D50345), *C. (s. str.) arvensis conciliator* (D50344), *C. (s. str.) a. arvensis* (D86203), *C. (Oreocarabus) glabratus* (D86207), *C. (Leptocarabus) procerulus* (D50357), *C. (Tomocarabus) harmandi* (D50364), *C. (Mesocarabus) problematicus* (D86210), *C. (Chaetocarabus) intricatus* (D86208), *C. (Ohomopterus) insulicola* (D50361), *C. (Archicarabus) nemoralis* (D86209), *C. (Limnocarabus) clathratus aquatilis* (D50358), *C. (Hemicarabus) tuberculosus* (D50353), *C. (Coptolabrus) fruhstorferi* (D50346), *C. (Damaster) blaptoides rugipennis* (D50351), *C. (D.) b. blaptoides* (D50349), *C. (Megodontus) kolbei* (D50365), *C. (M.) violaceus* (D86211).

Biohistory Research Hall) for the arrangement of the Sino-Japanese Cooperative Expedition to Sichuan, China, in 1997. Thanks are also due to Drs. Shun-Ichi UÉNO (National Science Museum, Tokyo) and Munehiro OKAMOTO (Osaka University) for their invaluable help in the collecting trip and DNA analyses, and to Dr. Thierry DEUVE (Muséum National d'Histoire Naturelle, Paris) for advice in identification of some *Cychrus* species. The first author, Y. IMURA, is grateful to Mr. Boleslav BŘEZINA (Prague) for kindly submitting a specimen of *C. brezinai* for comparative study.

要 約

井村有希・蘇 智慧・大澤省三：中国四川省のセダカオサムシ族；2新種の記載と同族の進化に関する考察。—— JT生命誌研究館と中国科学院動物研究所との合同調査により得られたオサムシ類のなかに、セダカオサムシ属の2新種をみいだしたので、それぞれにチュウセダカオサムシ *Cychrus zhoui* nov. およびオカモトセダカオサムシ *Cy. okamotoi* nov. という新名を与えて記載した。同時に得られたチベットセダカオサムシ *Cy. thibetanus* と別属のタツノコニセダカオサムシ *Cychropsis draconis*，ならびに日本産のセダカオサムシ *Cychrus morawitzi* とともに、ミトコンドリアND5遺伝子のDNA塩基配列を決定し、分子系統樹を作成して、その進化の過程に関する検討を行ったところ、つぎのような結論が得られた：1) セダカオサムシ族の起源は古く、分子系統上、オサムシ族の外群を形成する；2) その分化はオサムシ族の一斉放散よりもやや古い時代に起きたものと推定される；3) 各種間の分岐が非常に深いにもかかわらず、同族内における基本的形態の変化はオサムシ族のそれに比べてはるかに小さい。

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Discovery of the Steninae (Coleoptera, Staphylinidae) on the Ogasawara Islands

Toshio KISHIMOTO

Laboratory of Entomology, Tokyo University of Agriculture,
Setagaya, Tokyo, 156-0054 Japan

The staphylinid fauna of the Ogasawara Islands (Bonin Islands) was reviewed by WATANABE (1978, *Mem. natn. Sci. Mus, Tokyo*, (11): 131–137), who did not record any species belonging to the subfamily Steninae. Examining the staphylinid collection made on Chichi-jima Island of the Ogasawaras, I found several specimens of *Stenus rugipennis* SHARP, 1874, a stenine species widespread in East Asia. Their collecting data are as given below. This is the first record of the Steninae from the oceanic islands.

Specimens examined. 2 exs., Mt. Tsutsuji-yama, Chichi-jima Is., Ogasawara Isls., 30–VII–1996, T. KISHIMOTO leg.; 2 exs., Mt. Shigure-yama, Chichi-jima Is., Ogasawara Isls., 9–VII–1997, T. KISHIMOTO leg.

In closing this brief report, I wish to thank Professor Yasuaki WATANABE and Dr. Shun-ichiro NAOMI for their kind advice, and also to Messrs. Takaya YASUI, Toshinobu MATSUMOTO and Kazuhiko MURATA for their help in field works.